firms, innovation, and incentives, and I have published articles on these subjects in several leading academic journals. I have consulted to the telecommunications industry on strategic and efficient pricing in several Midwestern markets. I have testified in Michigan (cases U-10860 and U-10775) regarding the proper interpretation of Long Run Incremental Cost and its role in pricing; and in other states regarding the economic interpretation of pricing and costing standards in the Telecommunications Act of 1996 and proper pricing for mutual compensation for call termination. I testified on behalf of Ameritech in the arbitration proceedings with TCG, AT&T and MCI, as well as in the cost proceedings in Indiana, Michigan, and Illinois. In 1979 and 1980 I worked as a Staff Economist at the Civil Aeronautics Board studying price deregulation of the airline industry. I have consulted in other industries on matters related to employee compensation and contracts, antitrust issues, merger analysis, and demand estimation and pricing. In July, 1995, I assumed my current position at the Law and Economics Consulting Group. My professional qualifications are detailed in my curriculum vitae, which is attached as Schedule 1.

3. The purpose of my affidavit is to respond to the criticisms by AT&T witness James Henson and MCI witness Dr. August Ankum of Ameritech's TELRIC cost studies, and their claims that Ameritech's interconnection prices in Michigan do not satisfy the conditions of the Telecommunications Act of 1996 that prices be "based on cost." In particular, I show that

- Ameritech's cost studies comply with the tenets of the Telecommunications Act of 1996, as well as the terms of the FCC First Report and Order that determined specific costing principles and standards for interconnection pricing.
- Ameritech's interconnection prices in Michigan, to the extent they deviate from Ameritech's TELRIC prices, are consistently below, not above, cost based prices.
- The criticisms of the commenters are based on a self serving and faulty understanding of the economics of forward looking cost-based pricing.

4. Some criticisms of Ameritech's TELRIC cost studies, particularly the criticisms by Mr. Henson, amount simply to the observation that in some cases they produce prices that are

higher than the interim prices in Michigan. The fact that the commenters would prefer lower prices to higher is not in itself an indictment of the validity of Ameritech's TELRIC cost studies, however. As is explained in Mr. Palmer's Affidavits, the interim prices for basic loops, basic ports, interim number portability, and local transport and termination were based on Ameritech's modified TELRIC studies, but were stripped by the Michigan Commission of *any* shared, common, and one-time non-volume sensitive costs. It is economically inappropriate, and in violation of the FCC Order, for these costs to be omitted from TELRIC prices. Other interim prices were based on AT&T proposed prices, which were lower still than the stripped-down Commission version of TELRIC prices. Hence, in my Affidavit I will focus my response comments on the validity of Ameritech's proposed TELRIC prices. Clearly, the validity of these prices renders the interim prices too low.

5. As I interpret them, the costing methodologies and guidelines enumerated in the FCC First Report and Order[1] and presented below provide the basis for calculating TELRIC in an economically sound manner. The following are the most important methodologies specified in the Order:

- Forward looking, best available technology based on existing network architecture.
- Actual or realistic, not optimal or idealistic, utilization rates and fill factors.
- Economic depreciation lives.
- Forward looking, risk-adjusted cost of capital.
- Include in TELRIC all attributable costs that are incremental to the element.

6. I have reviewed the cost methodology developed by Ameritech and in my judgment Ameritech's cost methodology, though perhaps overly conservative, is consistent with

[1] FCC First Report and Order, In the Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Docket 96-98, FCC 96-325 (hereafter "FCC Order").

the five costing principles prescribed in the FCC's TELRIC costing method for the following reasons:

- The Ameritech studies use forward looking assumptions about new technology deployment, given Ameritech's existing facilities and network architecture. The studies also incorporate, to the extent possible at this time, the costs of unbundling and the effects of the FCC's unbundling requirements on network design and operations.

- The Ameritech studies use target actual fill factors rather than idealistic engineering fill factors. Ameritech has chosen not to use its current actual fill factors. This decision has resulted in TELRIC costs and prices that are below what they would be if Ameritech were using its actual fill.

- The Ameritech studies use depreciation rates that are more conservative than their best estimates of economic depreciation rates, which should incorporate the expected effects of competition and the FCC's unbundling requirements. Although these effects will increase the economic rate of depreciation of Ameritech's network facilities, Ameritech's assumed depreciation rates are conservative in that they equal the rates Ameritech has used since 1994 for financial reporting purposes and for several years in its retail TSLRIC studies.

- The Ameritech studies use a cost of capital that is more conservative than their best estimates of the Company's "risk-adjusted cost of capital," which should include the effects of competition and the FCC's unbundling requirements, and which will increase Ameritech's risk-adjusted cost of capital. Rather than increasing its cost of capital in response to these increased risk, in Michigan, Ameritech is adopting a conservative cost of capital which is the same rate it has used in its TSLRIC studies for several years.

- The Ameritech studies attempt to attribute as many of the costs that are caused by the production of a network element to the TELRIC of the UNE. In fact, however, not all costs that are incremental to UNEs were captured in the study. This is a flaw that causes Ameritech's TELRICs to understate true forward looking costs.

7. Underlying or explicit in many of the commenters' criticisms of Ameritech's cost models is an erroneous and unsupportable understanding of proper economic methodology for determining TELRIC-based prices. I will focus on these criticisms in my affidavit. My affidavit is organized as follows. In Section II, I will respond to the criticisms of Dr. Ankum regarding the alleged flaws in Ameritech's unbundled loop studies. I show that his criticisms reflect an

erroneous and self serving interpretation of efficient network utilization, as well as an economically defective understanding of the concept of forward looking costs. In Section III, I respond to Dr. Ankum's comments about Ameritech's cost of capital, and Section IV responds to Dr. Ankum's position regarding Ameritech's assumed economic depreciation lives. Section V addresses other criticisms of the cost studies, including issues of collocation, shared and common costs, residual costs, and the overall reasonableness of the level of TELRIC costs. Section VI responds to the commenters' position that UNE prices are too high with a detailed explanation of the several respects in which Ameritech's costs studies clearly understate true forward looking costs.

II. AMERITECH'S UNBUNDLED LOOP COST STUDIES

8. Dr. Ankum provides two main criticisms of Ameritech's unbundled loop costs studies. These are methodological complaints which, as I will explain, are based on a self-serving and intellectually unsupportable interpretation of proper economic cost analysis.

A. Fill Factors

9. Dr. Ankum's first complaint is that Ameritech "inappropriately lowers its own estimates for capacity utilization of its outside plant facilities for purposes of costing unbundled loop facilities to be leased to competitors."[2] In fact, the FCC Order is clear about the proper assumptions regarding network utilization. The FCC requires that TELRIC models use realistic assumptions about capacity utilization rates and fill factors. As the FCC concludes,

> "under a TELRIC methodology... Per-unit costs shall be derived from total costs using reasonably accurate "fill factors" (estimates of the proportion of a facility that will be "filled" with network usage); that is, the per-unit costs associated with a particular element must be derived by dividing the total cost associated with the element by a reasonable projection of the actual total usage of the element. Directly attributable forward looking costs include the

[2] See June 5, 1997 Affidavit of Dr. August Ankum, p. 29.

> incremental costs of facilities and operations that are dedicated to the element. Such costs typically include the investment costs and expenses related to primary plant used to provide that element."[3]

10. Dr. Ankum misrepresents the record in Michigan to create the impression that Ameritech is claiming that the actual utilization of its network should decrease as a result of competition. In fact, the opposite is true. Ameritech has chosen for its TELRIC cost study inputs fill factors that *significantly exceed* the actual current utilization of its outside plant facilities. The fill factors Ameritech has used in its TELRIC studies are referred to by Ameritech as "objective" or "target" rates. As explained in Ameritech witness Mr. Palmer's affidavit, they are target fill factors in the sense that Ameritech engineers have determined that these rates reflect an optimal tradeoff between maintenance of existing plant and necessary addition of new plant. The fact that these target fill rates are higher than the actual utilization of the network means that Ameritech's TELRIC cost studies reflect a far more ideally efficient utilization of the network than is currently achieved (or that may ever be achieved in the real world). The assumed rates are also entirely consistent with Dr. Ankum's view that competition will drive network utilization up.

11. Dr. Ankum's discussion of fill factors disingenuously confuses two different fill factor concepts that have been relevant to the development of Ameritech's TELRIC cost studies. The first is "engineering" or "usable" fill, and the second is the "target" or "objective" fill factors I referred to earlier. The first concept, which I will call usable fill, refers to the amount of capacity that could technically be used in the network, given that some capacity must be set aside for administration, testing, and maintenance. For example, less than 100% of a given feeder or distribution cable is actually available for use to provide service to customers. Just as in a restaurant, some of the floor space must be set aside for the kitchen and service areas, and in an

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[3] FCC Order, paragraph 682.

airplane some of the seats must be set aside for the flight crew, in a length of cable, some of the pairs of wires in the cable must be set aside to ensure that the rest of the cable functions properly.

12. In its past TSLRIC studies of retail service for the purpose of setting price floors, Ameritech assumed usable fill factors. This assumption was not intended to represent a realistic estimate of the actual or ideal use of the network. To see why it would not be ideal, consider the analogies of the airplane or the restaurant. If the airline always filled every passenger seat (minus those necessary for the crew), the airline *would not be running optimally* because it clearly should increase its capacity (or raise price to decrease demand). By always running full, it must routinely be turning away passengers. A rational airline would seek to increase capacity to handle that demand. But in doing so, it will necessarily have spare seats on some flights. Those seats are there to handle the variation in demand that naturally occurs, and are not a waste or a sign of inefficiency. On the contrary, they benefit all customers by increasing the chance for each customer of getting a seat on a desired flight. Moreover, the price passengers pay for their seats must, for the airline to be viable, recover not only the cost of their own seats, but must, in the aggregate, recover the cost of the spare seats as well.

13. Similarly, a restaurant that fills every table at every meal is a restaurant that is likely to be looking for a larger space. Rational business people know that running at full capacity is running too full. As the restaurant expands to meet the demand of its customers, it will rationally expand to the point where sometimes, perhaps often, it has empty tables. This does not mean that the restaurant is "too big;" instead, an optimally sized restaurant will sometimes have spare tables so that it is not in the position of always turning away customers during high-demand times. And again, the prices customers pay for their meals must recover the cost of the spare tables as well as their own food, table, and service, or the restaurant would go out of business.

14. Just as the restaurant and the airline will rationally maintain spare capacity in order to serve the variations in demand over time, a local exchange network should also be engineered to have spare capacity to handle variations in demand, over both time and geography. If a network were engineered to satisfy precisely the demand in place at a point in time, then *each time* a customer requested a second line, or there was a request for new service, new capacity would have to be installed, or the customer would have to be denied service. Installing new capacity means that streets and sidewalks would have to be torn up and repaired, workers would be dispatched down manholes and/or up utility poles to lay new cable, and flower beds would be dug up to install new distribution. Not only would this be extremely costly (in fact, literally to operate this way would be impossible due to the discontinuities in available cable size), it would sacrifice economies of scale. This is because, by accounting in advance for spare capacity needs, Ameritech can lay larger cable than it would if it only added capacity as needed, and per-line cable costs fall as cable size rises. Hence, the absurdity from a business standpoint, as well as a public policy standpoint, of planning to operate at useable fill factors is evident.

15. The fact that Ameritech, as the incumbent LEC, has an obligation to provide ubiquitous service on demand makes such a strategy, of maintaining a constantly "full" network, illegal as well as irrational. Ameritech could not satisfy its obligation to provide service on demand if it had to install new capacity, or turn customers away, with each new request.

16. Instead, what Ameritech and what every local exchange provider does is maintain spare capacity in its network in order to handle changes and variability in demand. A typical configuration for distribution plant, for example, might be to install enough plant in a neighborhood to satisfy 1.5 lines per household. Some of those households will want second (or third) lines, some will not. By installing spare lines, customers' demand for second lines can be accommodated without delay or costly "emergency" installation. When use of the existing cable begins to fill up and maintenance costs begin to rise significantly as a result, more cable will be installed. The optimal time for this reinforcement will be *well before* the existing plant is used to

capacity. Hence, the ideal utilization of the plant will always be well short of the usable capacity. This ideal utilization is what Ameritech refers to as "target" fill. The clear economic necessity and rationality of engineering a network to hold spare capacity is reflected in the FCC's *requirement* on paragraph 682 (cited above) that TELRIC models use realistic assumptions about capacity utilization rates and fill factors.

17. Despite the evident economic logic against usable fill factors ever representing efficient usage a real network, and despite the FCC's specific instructions to use a *reasonable projection of the actual total usage of the element*, Dr. Ankum advocates the use of usable fill factors, as opposed to target fill factors, in Ameritech's TELRIC cost studies.[4] That advocacy is not only contrary to economic logic, it is in violation of the plain meaning of paragraph 682 of the FCC First Report and Order cited above.

18. Indeed, the considerations I have outlined, as well as the FCC's own authorization of the use of "reasonably accurate 'fill factors'" -- would support Ameritech Michigan's use of its *actual* fill factors in determining its unit TELRIC costs. Ameritech's use of objective fill factors is therefore conservative (i.e., results in lower costs) relative to what was explicitly authorized by the FCC in its First Report and Order. Rather than using its actual utilization rate, Ameritech chose instead to use its best estimate of a future target utilization rate, which is substantially higher than its actual utilization. If Ameritech had used its actual fill, as authorized by the FCC, instead of its objective fill, its TELRIC costs, and UNE prices, would be significantly higher.

19. Dr. Ankum's position that Ameritech should use engineering or usable fill factors is in fact contrary to his own previous advocacy in Michigan. During the MCI arbitration proceeding in Michigan, MCI advocated the use of the Hatfield model Version 2.2.2 as the basis for setting interim and permanent rates in Michigan. Dr. Ankum himself supported the Hatfield

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[4] See June 5, 1997 Affidavit of Dr. August Ankum, pp. 29-31.

Model.[5] Fill factors used by Ameritech in its TELRIC studies are in every case *equal to or higher than* those used as defaults in the Hatfield Version 2.2.2 study, as the following table illustrates.

Ameritech Fill Factors			Hatfield Model Default Fill		
Feeder	Feeder Life Span Equipment	Distribution	Density[6]	Feeder	Distribution
80%	85%	75%	<5	65%	50%
			5-200	75%	55%
			200-650	80%	60%
			650-850	80%	65%
			850-2550	80%	70%
			2500+	80%	75%

20. I have attached as Schedule 2 to this affidavit a copy of the loop fill factor default inputs printed from our electronic copy of the Hatfield Model v. 2.2.2 for Michigan, which are identical to the Hatfield default fills indicated above.

21. Despite his previous advocacy, Dr. Ankum now argues that Ameritech should adopt usable fill factors because it is economically inappropriate for fill factors to reflect spare capacity for growth.[7] This argument is incorrect for two reasons. First, it is factually incorrect that Ameritech's fill factors necessarily represent spare capacity for growth. As I explained above, spare capacity is necessary to accommodate variability in demand, with or without net

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[5] Dr. Ankum writes: "We urge that the state regulators use the Hatfield Model to establish prices in conformance with TELRIC principles..." p. 28, "An Economic White Paper on Behalf of MCI Telecommunications Corporation," August 28, 1996.

[6] Density is lines per square mile. Ameritech's target fill factors do not vary with density.

[7] See June 5, 1997 Affidavit of Dr. August Ankum, pp. 29-32.

growth. Airlines maintain spare capacity not necessarily because they expect demand to grow next year, but because demand is higher on Friday evenings than Wednesday mornings, and because some Fridays are simply and unpredictably busier than others. Similarly, networks must maintain spare capacity because it is unpredictable which households will demand new or additional lines. For example, consider two Detroit suburbs, Oak Park and Southfield. It could turn out that 30% of households in each neighborhood demand a second line. Or it could turn out that 60% (or 100%) of households in Oak Park demand second lines, and none do in Southfield. Of course, all scenarios in between are possible as well. Planning for 30% in each suburb will not suffice to handle the possibilities (and statistical likelihood) of unbalanced patterns of demand. To handle at least some of those possibilities in an efficient way, more than 30% spare capacity must be installed in EACH neighborhood if 30% additional lines are expected on average. As another example, if a family that subscribes to two lines moves from Oak Park to Southfield, the lines relinquished in Oak Park cannot be used to provide service in Southfield. Outside plant capacity is highly location specific. Hence, spare capacity must be available in Southfield to serve the family, despite the fact that spare capacity will also be created in Oak Park when the family moves.

22. Hence, to the extent that Ameritech's target fill factors reflect any "growth" related spare capacity, they reflect the standby capacity built into the network necessary to provide current subscribers with the kind of service that they have come to expect. Reduction of this standby capacity would result in increased cost of maintenance and increases in the time required to provide customers with additional services such as second lines. This standby capacity has value to current subscribers because it provides each of them the option to acquire, without delay, additional services. Although any business would prudently install sufficient capacity to provide for maintenance and some growth, it is very important to note that Ameritech is additionally obliged under its service standards to provide service on demand. If Ameritech were to install a network that could not accommodate, *without delay,* a reasonable amount of

growth, it would very shortly find itself before the Commission to answer to a CLEC's accusation of delays in providing service. In short, as a result of its obligation to serve, Ameritech must incur the costs associated with building a network with the capacity to provide service on a timely basis. Since this investment is mandated by its regulators, Ameritech must be given the opportunity to recover the costs of that investment.

23. In fact, all of Ameritech's net growth in access lines in Michigan in 1996 has been in additional (second, third, etc.) lines for existing customers, not from new service or service to new customers. This fact renders Dr. Ankum's assertion that including the cost of any standby capacity amounts to an "inter-generational transfer"[8] from current to future customers particularly inappropriate. The utilization of spare capacity in place is currently being used to satisfy the growth in demand of *current* customers. If there were no spare capacity in the network, each customer would have to pay the costs of new installation of distribution, feeder, and drop, including tearing up streets and flower beds, in order to acquire a second line. The cost to the subscriber would be significantly higher than the cost of acquiring the second line under current conditions. Instead, each customer pays, in existing prices, something for the option of increasing their own use of the network in the future, just as restaurant customers contribute to the cost of the empty tables. It is efficient to do so. It involves no inter-generational transfer.

24. Dr. Ankum's second argument in support of usable fill factors is his reference to Just In Time manufacturing techniques, by which firms attempt to minimize inventory. Dr. Ankum's vague and superficial appeal to Just in Time is erroneous, however. Just in Time manufacturing attempts to minimize the inventory of *material inputs* into production (such as nuts, bolts, tires, and fabricated body moldings, for example, in an auto plant) by providing these inputs on an as-needed basis; Just in Time does not attempt to minimize fixed *capacity* in place by somehow providing *it* on an as-needed basis. As I discuss in my academic paper on the

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[8] See June 5, 1997 Affidavit of Dr. August Ankum, pp. 29-31.

topic[9], Japanese manufacturing techniques (of which Just in Time is a component) have two important virtues: first, the lack of inventories of material inputs reveals production errors in real time, so that they can be corrected in real time; and the conservation of inventories conserves storage space, which is precious in space-starved Japan. Neither of these considerations applies to the management of productive capacity, particularly the capacity for provision of telecommunication network services. As I explained above, the idea that one could or would seek to provide productive outside plant capacity as needed in real time is ludicrous on its face.

25. To the extent that his advocacy relies on Ameritech's own documents, Dr. Ankum's discussion of network utilization disingenuously confounds documents that relate to usable fill (which will always be higher than a reasonable projection of actual total usage of the network); and documents that relate to actual usage of the network (these latter are the documents that discuss the desirability of increasing actual utilization above current actual utilization, and they support Ameritech's decision to set target fill above actual fill). Dr. Ankum portrays Ameritech as assuming that the advent of competition in Michigan will decrease network utilization. In fact, Ameritech's revision of its fill factors in light of the Act and the Order constitute a paradigm change from usable to target fill. As I explained above, Ameritech's choice of target fill factors, rather than actual fill, assumes that actual usage of the network will increase going forward. For example, for feeder plant, Ameritech's usable fill in its retail service TSLRIC studies was 85%[10]. Ameritech's target fill for feeder plant is 80%, while the actual utilization on feeder plant in Ameritech's network ranges from 55% to 65%. The change from 85% to 80% reflects a conceptual change in approach from the usable fill to a target fill, in accordance with economic principles and the FCC Order. The difference between the 80% and the 55%-65% reflects Ameritech's view that ideally efficient usage of the network is higher than

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[9] Aron, Debra J., and Olivella, Paul, "Bonus and Penalty Schemes as Equilibrium Incentif3 Devic4es, with Application to Manufacturing Systems," *Journal of Law, Economics, and Organization*, 1994, v.10, N1, 1-34.

[10] According to Ameritech's August 1995 AOE (Ameritech Operating Environment) document which lists the assumptions that were used in Ameritech's LRSIC cost studies.

the current actual utilization, and is consistent with Dr. Ankum's premise that competition will increase network utilization.

26. Contrary to Dr. Ankum's claim, usable fill is not treated in the AOE as a reasonable projection of actual usage, nor is it reasonable to treat it as such. Moreover, that document has now been revised to reflect the target utilization factors that Ameritech has adopted for TELRIC, and that Ameritech intends to use in its TSLRIC studies going forward.

B. Forward looking costs in the AFAM model

27. Dr. Ankum's second criticism of Ameritech's cost studies for unbundled loops is that the Ameritech AFAM model (this is the model that uses loop study data to calculate the forward looking loop costs) does not "eliminate stranded facilities" or "redesign for optimal feeder lengths."[11] Ameritech's cost study uses the AFAM model to analyze the demand on particular feeder and distribution routes. AFAM determines the optimal type of outside plant (i.e., fiber or copper) for the given loop segment for the given location, and it determines the optimal size and gauge of cable to suit the anticipated demand. Dr. Ankum's objection is that the AFAM study does not also reroute all of the distribution and feeder plant to some idealized route structure under a projected future geographic pattern of demand; instead, the model takes the existing geographic placement of feeder and distribution as given.

28. Ankum's complaint regarding Ameritech's use of the AFAM loop model is a good example of how the FCC's concept of forward looking costs can be misapplied and overidealized by commenters in these proceedings. The flaw in Dr. Ankum's argument derives from a convenient but improper interpretation of the concept of forward looking costs.

29. Indeed, the criticism that Ameritech's cost studies are not sufficiently "forward looking" is a common theme in Dr. Ankum's affidavit. (I will identify and address other specific

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[11] See June 5, 1997 Affidavit of August Ankum, p. 27.

examples of this sort of criticism later in my affidavit.) This is a generically convenient criticism because his use of the term "forward looking" is sufficiently vague that modeling assumptions that reflect anything short of an idealized, perfectly efficient firm can be made subject to this criticism. "Forward looking" costs, however, can be clearly understood on the basis of fundamental economic principles. While most economists agree that the proper economic costs on which to base market prices should be forward looking, the debate in the telecom arena has been confused as to *whose* forward looking costs should form the basis of TELRIC: those of the incumbent, those of an entrant, or those of a hypothetical, maximally efficient firm? In advocating forward looking costs, commenters have subverted this concept to mean the forward looking costs of a hypothetical maximally efficient firm. However, basic economic principles of cost and competition dictate the correct answer: prices charged by the incumbent should be based on the forward looking costs of the *incumbent*.

30. To understand why, it is important to understand why economists have concluded that forward looking costs are the proper costs on which to base prices. Take the example of a retail gasoline station. Suppose the owner had purchased the gasoline in his holding tanks at the wholesale price of $.90 per gallon, but a political upheaval in the Middle East subsequently causes expected future supply to fall. Suppose that as a result, wholesale prices rise to $1.00 per gallon. Now, what is the proper cost for the gasoline owner upon which to base the retail price of his *existing* stock of gasoline, which was purchased at $.90? The proper cost is not the historical or embedded cost of $.90, but rather the forward looking cost of $1.00. The reason is that for every gallon the owner sells, he will incur a $1.00 cost to replace it to sell to another customer. Looked at another way, he could sell it on the world market for $1.00 at wholesale, rather than to retail customers; so he gives up the $1.00 for every gallon he sells at retail, which means his cost is $1.00.

31. How does this example relate to the issue at hand? The point is that the true economic cost of the gasoline is $1.00 because *that is truly the cost that the owner is expected to*

bear going forward. The cost is not based on any idealistic notion of hypothetical costs; nor on the historical, embedded costs of the existing supply; nor on the costs that a competitor bears if, say, the competitor has special access to a better or worse price; nor on a projection of prices in some indeterminate future. Rather, the owner's forward looking costs (i.e., his economic costs) are the true cost the owner expects to face to replace his current supply.

32. For telecommunications carriers, the same logic of forward looking costs applies: costs should be forward looking costs of the incumbent, not an entrant or an idealized firm. The cost (at the margin) to an incumbent of providing service should reflect the cost that the incumbent will incur to provide that service on a going forward basis. It should correspond to the technology the incumbent will adopt going forward, and the costs of inputs it will bear, because these reflect the incumbent's actual forward looking costs: going forward, the incumbent will provide service using the best available technology that it finds economical to adopt, and will employ inputs such as capital and labor at market rates, rather than historical rates.

33. The FCC clearly intended for costs to reflect actual forward looking costs of incumbent carriers:

> "Forward looking cost methodologies, like TELRIC, are intended to consider the costs that a carrier would incur in the future...This benchmark of forward looking cost and existing network design most closely represents the incremental costs that *incumbents actually expect to incur* in making network elements available to new entrants."[12] [emphasis added]

34. Other economists share this understanding of forward looking costs. According to the renowned economist Professor Alfred Kahn,

> The general economic principle...requires that the correct pricing 'signals' inform consumers of the costs that society will actually incur if they take somewhat (or a lot) more of each good or service- or that society will save if

[12] FCC Order, paragraph 685.

> they take less. These can only be the actual incremental costs of the incumbent companies.
>
> ...In unregulated markets, prices tend to be set on the basis of the actual costs of incumbent firms. That gives challengers the proper target at which to shoot, the proper standard to meet or beat and the proper reward if they succeed. If they can achieve costs lower than that, they will enter and in the process (which the FCC's pricing rules would short circuit) beat prices down to efficient levels. Ultimately, only the market, and not regulators, can determine the efficient result.[13]

35. To operationalize this intent into a costing methodology, the FCC defines "forward looking" as follows:

> "...the forward looking pricing methodology for interconnection and unbundled network elements should be based on costs that assume that wire centers will be placed at the incumbent LEC's current wire center locations, but that the reconstructed local network will employ the most efficient technology for reasonably foreseeable capacity requirements."[14]

36. As the FCC makes explicit, a proper implementation of forward looking costs of the incumbent must reflect the existing network architecture that the incumbent has in place. This distinction, between the forward looking costs of the incumbent, and the forward looking costs of an idealized firm, is precisely the distinction drawn by the FCC in its examination and rejection of the "scorched earth" methodology[15] in contrast to the "scorched node" approach.

37. It might be argued that requiring forward looking costs to be those of the incumbent presents the risk that incumbents can expect to be highly inefficient going forward, and nevertheless recover their costs. There are two reasons why this is not a valid concern. First, the fact that Ameritech operates under price regulation rather than rate of return regulation means that any efficiencies achieved by Ameritech benefit Ameritech's bottom line. This has enhanced and will continue to enhance Ameritech's incentive to minimize costs going forward.

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[13] Letter to Reed E. Hundt, January 14, 1997, pp. 1-2.

[14] Ibid.

[15] FCC Order, paragraph 683.

Moreover, Ameritech and all incumbent LECs have a strong additional incentive to minimize costs going forward, because they will experience the discipline of competition. The principle that competition induces firms to strive for efficiency is one of the underpinnings of the Act.

38. Second, as noted by Dr. Kahn above, basing prices on true forward looking costs is the means by which more efficient firms have the opportunity to enter and make a profit. If prices were based on idealized costs, no firm, even if it were truly more efficient than the incumbent, could enter and profit from its enhanced efficiency. Prices based on idealized costs do not promote competition; on the contrary, they impede entry, and they impede competition. If prices were set as if the incumbent were the idealized, hypothetical maximally efficient firm starting from a scorched earth, it would be impossible, by definition, for any other firm to compete and expect to earn an economic profit. No competitor could outdo the incumbent, and there would be no positive incentive to enter the market.

39. Because Ameritech is constrained by its existing network architecture (node structure) and entrants can produce their networks with a clean slate, entrants have a natural cost advantage over Ameritech in this regard. To the extent that entrants can capitalize on that advantage, they will earn positive economic profits while driving Ameritech's economic profits to zero (or below). If Ameritech were required to price UNEs as if it did not have a fixed node structure, but rather had a clean slate, Ameritech would be unable to recover its true forward looking costs, and entrants would have no opportunity to benefit from their true cost advantage.

40. The FCC's logic in rejecting the scorched earth methodology reflects these economic principles. The FCC states that by not employing the scorched earth approach we will "encourage facilities-based competition to the extent that new entrants, by designing more efficient network configurations, are able to provide the service at a lower cost than the incumbent LEC."[16] The alternative "may discourage facilities-based competition by new

[16] FCC Order, paragraph 685.

entrants because new entrants can use the incumbent LEC's existing network based on the cost of a hypothetical least-cost, most efficient network."[17]

41. Armed with a properly economics-based understanding of forward looking costs, I believe it is clear that Ameritech's AFAM model is appropriately forward looking and consistent with the FCC's TELRIC methodology. Ameritech's costs, going forward and providing services efficiently, would not reflect the costs of a network with an idealized route structure for outside plant. The rationale articulated by the FCC as to why the scorched earth approach is invalid (cited above) applies verbatim to Dr. Ankum's criticism of Ameritech's use of the AFAM model. Moreover, the Michigan Commission has specifically addressed this issue and rejected Dr. Ankum's recommended methodology.

> Technology used in a long run incremental cost study should be the least-cost, most efficient technology that is currently available for purchase. This assumes existing location of structural facilities, but allows for replacement with the most efficient least cost technology.
>
> Basically, this principle means that any LRIC analysis should be based on the location of existing and planned switching and *outside plant facilities.* [Emphasis added].[18]

III. COST OF CAPITAL

42. Dr. Ankum criticizes Ameritech Michigan's cost of capital assumptions because they do not "distinguish" between the risk of the retail and wholesale operations.[19] In fact, it is my understanding that the cost of capital that Ameritech is using in its proposed prices is identical to the cost of capital Ameritech has been using in its retail TSLRIC studies and has used for some time. Nevertheless, Ameritech's risks have increased due to the increasingly

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[17] FCC Order, paragraph 683.

[18] See TSLRIC cost principles contained in the Michigan Public Service Commissions Order in U-10620, Exhibit A, p. 5.

[19] See June 5, 1997 Affidavit of Dr. August Ankum, pp. 44-45.

competitive environment in which it now operates. Dr. Ankum fails to recognize, therefore, that by not adjusting its cost of capital to account for these increased risks, Ameritech's cost of capital approach is conservative.

43. The FCC Order properly concludes that a forward looking, risk-adjusted cost of capital should be used in TELRIC studies. These capital costs should be calculated by analyzing actual conditions prevailing in debt and equity markets, and not arbitrarily determined by regulators.

> "Forward looking cost of capital. The forward looking cost of capital shall be used in calculating the total element long-run incremental cost of an element.[20]
>
> [W]e also agree that, as a matter of theory, an increase in risk due to entry into the market for local exchange service can increase a LEC's cost of capital."[21]

44. Use of forward looking cost of capital is particularly important because incumbent LECs face increased risks to their revenue streams as competition increases in the new post-Telecom Act environment. Ameritech's risk is quantified by the capital market by the stock's "beta," which is a statistic measuring the stock's relative volatility. A firm's beta is used to determine the risk adjusted cost of equity capital. The higher the beta, the higher the cost of equity. Ameritech's beta has increased significantly since the passage of the Telecommunications Act of 1996, from 0.89 on January 15, 1996 to 1.12 on July 2, 1997, according to Dow Jones News/Retrieval Service.

45. From an economic standpoint, it is appropriate to adjust the cost of capital to account for Ameritech Michigan's increased risk. Ameritech Michigan, including its UNE operation, faces the risk of stranded plant and loss of customers for each UNE that it offers. This

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[20] FCC Order, Appendix B, p. 30.

[21] FCC Order, paragraph 687.

fact is underscored by AT&T's announcement of its wireless loop technology, as well as other entry strategies I discuss later in this affidavit. Clearly, the risks associated with operating in a competitive market are higher than the risks faced by Ameritech when it had a protected franchise. When Ameritech had a protected franchise, it faced little risk of loss of market share, or of stranded capital. Ameritech did face risks, such as the macro-economics risks of business cycle swings, or risks that investments in new technologies would prove less efficiency-enhancing than anticipated. In the newly competitive environment, however, Ameritech and its investors face all these risks, and more: they also face the risks of stranded plant, loss of customers, and loss of market share, to which Ameritech was substantially immune before unbundling.

46. AT&T cost witness Mr. Henson agrees that increased competition would increase Ameritech's cost of capital. In the Ameritech Ohio "permanent" cost docket, Mr. Henson gave the following testimony:

> Q. Well, would you agree with this; That we're going to see a significant increase in competition in the coming months if Congress' intent is carried out?
>
> A. Yes.
>
> Q. And do you agree that increased competition will bring with it greater business risk and financial risk for Ameritech?
>
> A. Certainly when contrasted with a monopoly situation, yes, it will.
>
> Q. And do you agree that the greater the risk, whether it's business risk alone or both business and financial in tandem, the greater the risk, the greater the firm's cost of capital is?
>
> A. Certainly, business risk directly relates to cost of capital. "Financial risk" is a term that I think company's have some control over. But to the extent that you have increased financial risk, your cost of capital goes up, yes.
>
> Q. And to the extent I increased business risk, my cost of capital goes up, too?

A. Yes.[22]

47. Because Ameritech is not adjusting its cost of capital to account for the increased risk it now faces, Ameritech is taking a very conservative approach indeed.

48. Nevertheless, Dr. Ankum faults Ameritech's cost of capital analysis for not estimating the cost of capital of the UNE business alone, separate from the capital cost of the firm as a whole. However, he proposes no methodology by which one could in practice estimate such a number, and I am aware of no accepted technique for doing so. Ameritech's cost of capital analysis is based on the standard cost of capital techniques known as the Capital Asset Pricing Model (CAPM), and the Discounted Cash Flow (DCF) approach. These (particularly the former) are the accepted techniques for determining a forward looking cost of capital. And while AT&T and MCI have quibbled over aspects of the implementation, their own experts in the cost dockets have adopted the same basic methodologies. Neither AT&T nor MCI (nor any other commenter to my knowledge) has proposed a different methodology, nor have they attempted to estimate a UNE-specific risk or cost measure, nor have they identified any methodology that would permit estimation of a cost of capital of the UNE business alone.

IV. DEPRECIATION

49. Dr. Ankum argues that the appropriate depreciation rates should be those determined in a prior FCC proceeding.[23] The FCC Order, however, requires *economic* depreciation lives be used in calculating the TELRICs of UNEs. This ensures that incumbent LECs have a reasonable opportunity to recover the full economic costs they incur when providing unbundled network elements. According to the Order:

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[22] See 2/18/97 Testimony of James F. Henson, pp. 86-87.

[23] See June 5, 1997 Affidavit of Dr. August Ankum, p. 45

> "The depreciation rates used in calculating forward looking economic costs of elements shall be economic depreciation rates."[24]
>
> "We conclude that an appropriate calculation of TELRIC will include a depreciation rate that reflects the true changes in economic value of an asset..."[25]

50. The effect of the Act itself must be accounted for in the proper determination of economic depreciation. The very purpose of the Act was to stimulate competition in telecommunication markets and this in turn will invigorate and accelerate the pace of technological change. As investments in new technology increases, existing capital will become obsolete more quickly than it has in the past. Because plant and equipment are likely to have shorter economic lives than in the former monopoly environment, the forward looking economic depreciation rates should be higher than the rate of economic depreciation that was heretofore appropriate, to reflect the "true changes in economic value" of the asset. In a rapidly changing market, historical data, i.e., data on the economic lives of the assets in the past, are a poor guide to the future.

51. Depreciation rates that were based on historical data in past studies, such as the FCC depreciation rates determined in 1995, would therefore not be appropriate in the post-Telecommunications Act world, and would not be appropriate in the context of a TELRIC cost study. It would be inappropriate and damaging both to Ameritech, and to competition, to fail to adjust these rates now to reflect momentous changes that have occurred in the market since passage of the Act. It would damage competition because an uneconomically slow rate of depreciation would result in prices for UNEs that are below their true long run cost. The effect would be to discourage competitors from building their own facilities, and to encourage inefficient entry. Ameritech would also suffer because it would be prevented from recovering the costs of those assets from the cost-causers. Eventually, Ameritech would either take a loss,

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[24] FCC Order, Appendix B, p. 30.

[25] FCC Order, paragraph 703.

or the costs of the UNE investments would be borne by Ameritech's end-user retail customers, to the advantage of the customers and shareholders of Ameritech's competitors.

52. In the words of Alfred Kahn,

> "The purpose of including an allowance for depreciation in price is to ensure recovery of invested funds over the economic life of the physical capital in which they have been embodied; and of course to see to it that *price reflects this authentic economic cost.*"[Emphasis added.][26]

53. There are three significant reasons why Ameritech Michigan's depreciation rates used in its TELRIC studies should be adjusted relative to prior FCC projection lives. All three reasons demonstrate that depreciation lives that were based on historical data in past studies would be too long for use in a TELRIC study in today's environment.

54. First, the TELRIC model (as implemented by Ameritech) ignores all costs of the flexibility and coordination that are built into real networks. It is fundamentally a static, rather than dynamic, model. Because the model effectively assumes that all capital would be put in place at one time, optimally adjusting to existing demand, the model does not account for the economic concept known as the "adaptability principle," first discussed in the economics literature by Nobel Laureate George Stigler.[27] The principle is a straightforward one: when firms face uncertainty about future demand and cost conditions, it is optimal to configure their plant and equipment not to maximize static efficiency, but rather to forego some myopic cost efficiencies in the interest of cost flexibility. If one knew with certainty what the economic market conditions were to be in the future, one could construct a highly customized infrastructure to accommodate those particular conditions. Such a highly customized system, however, is not likely to be robust to different demand, supply, or technology conditions. If demand turns out to be higher than expected, for example, such a system would require significant new investment

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[26] Alfred E. Kahn, *The Economics of Regulation*, Volume I, (New York: John Wiley & Sons, Inc., 1970), p. 117.

[27] George Stigler, *The Theory of Price*, (New York: MacMillan Publishing Co., 1987), pp. 136-138.

and installation of plant to accommodate the demand. In real markets, it is typically better to build a system that can handle a wider array of market outcomes, though it will handle none of them at the customized "optimal" efficiency.

55. The relevance of Stigler's insight to the TELRIC model is the fact that, because real networks cannot be built instantaneously with a single technology, they must be engineered to be flexible enough that components of different technologies and vintages work together seamlessly. This is ignored entirely in the TELRIC model. Coordination of multiple technologies is a significant engineering concern in real network design, and Ameritech's network is designed so that components can remain usable when they are called upon to work with other components using newer technologies. This efficiently enhances the lives of the older assets. Such design issues are ignored in the TELRIC model because the model assumes one can build an entire, brand new, state-of-the-art network instantaneously. Hence, the model does not build in to the hypothetical forward looking network the flexibility and coordination that is required in real networks. It does not build into the network the flexibility to work with future technologies. And it does not account for any of the costs of configuring (or reconfiguring) equipment so that it works together with newer equipment.

56. For example, when Ameritech began to adopt digital switch technology, all of the analog switches in place had to be modified to interact properly with digital switches, and the digital switches had to be augmented with the proper hardware and software components to function with the analog switches. When the next generation of switch technology arrives, the digital switches being installed today will have to be fitted to function with the new technology. If they were not so fitted, the new technology would render the existing switches unusable and immediately obsolete. None of these expected costs of making the existing technology functional with future technology, or actual costs of making the current technology functional with embedded technology, are included or accounted for in any way in TELRIC.

57. A recently signed pact between American Airlines and Boeing is a good illustration of the importance of technological "commonality." American Airlines plans to phase out older planes in its fleet, such as McDonnell-Douglas MD-80s and Boeing 727s, over the life of the twenty year contract.[28] Mr. Robert Crandall, chairman and chief executive of American Airlines explained in his comments about the deal that, although they will be purchasing several models of airplanes, it is cost effective for the airline to own and operate airplanes from a single manufacturer such as Boeing. The reason is that doing so minimizes on training of mechanics and technical support personnel, as well as simplifying their deployment, scheduling, and logistics. Rather than, say, having to train mechanics in the idiosyncrasies of Airbus aircraft as well as Boeing aircraft, and then making sure that the right type of mechanic is in the right place at the right time, some of those complexities are eliminated. According to the Wall Street Journal,

> American's fleet will become an all-Boeing air force over the next two decades. Among major carriers, only Southwest Airlines has a single-manufacturer fleet, resulting in reduced maintenance, training and crew costs.
>
> "I think there will be a very favorable impact on our cost structure as commonality increases, but it will occur over a long period of time," said Mr. Crandall.[29]

58. The additional costs that are incurred in order to run a multi-manufacturer airline (and that American seeks to avoid) are analogous to the additional costs that must be incurred to engineer a multi-vintage network. These latter costs are not accounted for in a single-vintage model such as Ameritech's TELRIC model.

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[28] See Scott McCartney and Jeff Cole, "American Airlines Signs Exclusive Pact To Buy Boeing Jets For Two Decades," *The Wall Street Journal*, 11/22/96, A3.; Scott McCartney and Jeff Cole, "American Air Likely to Buy Boeing Plane --- Carrier Expected to Give Details of Order Valued At More Than $6 Billion," *The Wall Street Journal*, 11/20/96, A3.; Raymond Lopez, "American Signs Boeing for Fleet Replacement," *Flight International*, 11/27/96.; Carol A. Shifrin, "American Commits to All-Boeing Jet Fleet," Aviation Week and Space Technology, 11/25/96, p. 34.

[29] Scott McCarthney and Jeff Cole, "American Airlines Signs Exclusive Pact to Buy Boeing jets For Two Decades," *The Wall Street Journal,* 11/22/96, p. A3.